

BASIC SCIENCES/REGULATORY PHYSIOLOGY

Current Concepts Concerning Thirst, Dehydration, and Fluid Replacement

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Current concepts concerning thirst, dehydration, and fluid replacement: overview

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ABSTRACT

SAWKA, M. N. and J. E. GREENLEAF. Current concepts concerning thirst, dehydration, and fluid replacement: overview. *Med. Sci. Sports Exerc.*, Vol. 24, No. 6, pp. 643-644, 1992. For healthy endurance athletes, two potentially life-threatening medical emergencies are dehydration-mediated heat injuries and hyponatremia. Likewise, dehydration reduces exercise performance via thermoregulatory and cardiovascular impairment as well as electrolyte imbalances. Authors of this symposium integrate new research findings with established concepts concerning the development of dehydration (body water deficit), the physiological and medical consequences of fluid imbalance, and fluid (volume and composition) replacement strategies that minimize the risk of medical emergencies and optimize exercise performance. The following papers provide the readers with an appreciation of the historical development of current concepts and offer an informed opinion concerning fluid replacement strategies for a variety of work performance athletic events.

DEHYDRATION, CARBOHYDRATE/ELECTROLYTE SOLUTIONS, FLUID REPLACEMENT, FLUID IMBALANCE, REPLACEMENT FLUIDS, HEAT INJURY

Individuals in athletic, occupational, or military settings may have to perform physical exercise in thermally stressful environments (7,8). Under such conditions relatively high sweating rates can be achieved for extended periods in order to defend body temperature

(7,8). During these conditions problems often occur concerning the replacement of water lost in sweat. If sweat loss exceeds fluid intake, dehydration will occur (8); however, if fluid intake exceeds sweat loss, water intoxication (hyponatremia) might occur (1,7). Both dehydration-mediated heat injuries and water intoxication can be life threatening for healthy athletes (2,8).

In some respects the concerns regarding fluid replacement during exercise-heat stress appear to have come full circle. Historically, numerous myths developed concerning the benefits of water deprivation; (e.g. dehydration toughens the psyche) and adherence to those beliefs has resulted in numerous civilian and military deaths from heat injury (3,4). Recently, water intoxication has been reported in ultramarathon and triathlon athletes (1,7), and these relatively few occurrences have resulted in concerns that current rehydration guidelines might be encouraging athletes to overdrink and not pay adequate attention to electrolyte replacement. In addition, the recent popularity of commercial carbohydrate-electrolyte beverages has resulted in an advertisement blitz concerning the potential benefits of rehydrating with these products during exercise-heat stress. Together, these factors have left some confusion regarding the proper rehydration guidance for athletes competing in different events.

Recently, these issues related to fluid imbalances and the possible need for glucose-electrolyte beverages during exercise-heat stress have received considerable scientific attention (2,5). This symposium was organized because the American College of Sports Medicine has not had a symposium, tutorial lecture, or colloquium that has addressed the development, consequences, and avoidance of fluid-electrolyte imbalances during exercise-heat stress. This symposium integrates new research findings with established concepts concerning the development of dehydration (body water deficit), the physiological and medical consequences of fluid imbalance, as well as fluid (volume and composition) replacement strategies that minimize the risks for medical emergencies and optimize exercise performance. The following papers are intended to provide the reader with an appreciation of the historical development of current concepts and offer informed opinions concerning fluid replacement strategies for a variety of athletic events.

Dr. John Greenleaf has reviewed the physiological mechanisms responsible for thirst being a poor indicator of body water and/or electrolyte needs. He has

integrated the complex issues concerning the regulation of body water and tonicity with the psychological components of thirst. Dr. Michael Sawka has examined the physiological consequences of body water loss on exercise performance. He has emphasized the relative importance of tonicity and blood volume changes in mediating altered thermoregulatory responses. Dr. Edward Coyle has examined the trade-offs between fluid, electrolyte, and carbohydrate replacement during exercise. He has focuses on how these replacement trade-offs might affect athletic performance. Finally, Dr. Carl Gisolfi has provided guidelines for fluid, electrolyte, and carbohydrate replacement strategies that meet the unique requirements for a range of different athletic events and environmental conditions.

The views, opinions, and findings in this report are those of the authors and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other official documentation. Approved for public release; distribution is unlimited.

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